BTeV Response to Recommendations of Temple Review – October 2003

Generic issues

Present the Organization chart through Level 3 and identify Level 3 Managers where possible.

Implement more uniform milestones identifying a few per year/Level 2 project for management to monitor.

Produce an agreed upon numbering scheme for the project.

We are in the processes of addressing the above three issues as described below in our detailed responses.

Support of OpenPlan in BSS. Many of our problems in this review were caused by problems and inexperience with version 3 of OpenPlan. BTeV must be the agency that determines when changes take place. If BSS is supporting us, they must agree not to pressure us into changes that can aversely affect our performance in reviews or our ability to manage the project. We hope that this will be a moot point but now comment that, having agreed to migrate to version 3, we have been requesting the installation of patches to fix the initial round of bugs in that version and, at a recent meeting, were given a lengthy schedule for making a schedule – not even a schedule for doing the work.

WBS 1.1

From the Recommendations

1. Complete and proofread the WBS dictionary and the BOE.
We plan to complete a review of this by the end of January and hold an internal technical review of the whole WBS and cost and schedule

2. Project Management should review the contingency estimate to put it on the same basis, relative to the technical and cost risks, as the other L2 tasks.

We agree that the contingency for this project is too high, We intend to insist on adherence to the contingency approach we have specified (modified version of D0/CDF method) and to ask for a justification of each item. If uniformly applied at a low level, the results should be consistent with results obtained for other subprojects, given that they will use the same methodology.

3. Review the milestones to ensure that they correspond to key events, accurately reflect real need dates, and are at the proper density to allow a clear measure of progress.
We will review all milestones and will give guidance on their density and scope.
Some of these issues were addressed at the installation workshop held on Nov. 13, 2003.

4. **Develop a coordinated assembly and installation plan with the IR and civil construction tasks.**

This is a finding that is related to many issues and is a result of the change in schedule and lack of detailed work on the C0 area and the IR. We will attempt to have a coordinated, working schedule by the middle of December and to present it at our collaboration meeting on December 12, 2003. . Some of these issues were addressed at the installation workshop. This might, however, need additional discussion. Many of the problems relate to the lack of a detailed schedule and length of collider shutdowns. At least we should have an agreed upon "strawman" schedule.

Other significant issues raised in the report (in findings or comments):

- **WBS: At least one error was found, in which the description of 1.1.2 implies two complete toroids.**

  Project scope should include the steel and installation for the second toroid. The coil and the power hookup could be left as a future option or included. The L2 project manager's remark about reducing the contingency to 22% to cover this was inappropriate. Although his contingency may be too high, it needs to be more than 22% and it needs to be determined by a rigorous bottoms up evaluation as discussed above.
- **The TDR chapter could be improved by adding more figures and tables giving quantitative information, in preference to some of the text. Fewer details of the procedures to move and rebuild the magnets would suffice, and the step-by-step plan could be moved to a separate referenced document.**

  The TDR chapter will be reviewed and edited and some of the textual detail will be removed and others will be added in tabular form as suggested.

WBS 1.2

From the Recommendations:

1. **Demonstrate the robustness of the proposed design in the case of failure of cooling.**

   Comprehensive tests are planned for the next six months. They include completion of the current round of tests: loaded cryopanel test and bump-bond thermal test and a new series of tests: cold block assembly test, FTB material test, and construction and test of a prototype control system. Manpower and money for M&S are issues.

2. **Continue to work with the Beams Division to understand beam loss scenarios as well as the steady state radiation profile and demonstrate that the detector can survive them.**

A radiation task force is being set up as part of the IR process. The MARS calculations will be repeated and extended by a member of the BTeV Collaboration (A. Uzunian). They will include a consideration of beam-halo induced backgrounds once the IR optics begins to take shape. We will begin regular meetings with Beams Division personnel to begin to consider protection of the pixel detector from beam related problems and failures and protection for the machine against problems from the detector.

3. **Consider increasing contingency on multi-component systems to reflect uncertainties or risks not present at the single-component stage.**

Reviewers commented on the necessity of doing a system test with all the components early in the construction to look for potential problems. We note that a 3% system or Station test was in our plans in the past (PAC comments years ago). They also commented the differences in approach amongst subprojects. We have tests of prototype components and a few components tested together in our current WBS. We will take these tests one step further to have a station test with cooling and in vacuum in 2005/2006. We will also attempt to understand the multicomponent issues and use that understanding to refine the labor and contingency estimates. Where possible, we will try to understand the experience of similar projects. Resources are an issue here as well.

4. **Ensure that the detector can meet Beams Division vacuum requirements.**

We agree and have looked into possible failure scenarios and how to mitigate these. We will complete a full layout of the vacuum system and controls (valves, gauges etc) and build a prototype liquid He cryopump .We will conduct an outgassing test on FTB; We will test full-size FTB early next year ('04).

Other Issues:

- **The present schedule reflects the funding profile explicitly but manpower limitations only implicitly.**

  We will address this in the next round of resource-loading and in contingency assignment

- **This project needs to receive its funding early in the construction period.**

  We will try to add some funding to the project in FY05

WBS 1.3:

Recommendations:

1. **Perform additional Monte Carlo studies to examine the phototube size for the liquid radiator photo-detector.**

We are re-examining the liquid radiator system with 396 ns bunch spacing. The reviewer suggested that it may be useful to decrease the occupancy by going to a 2” phototube size rather than the 3” size we have in the baseline. This would cost an additional ~700K$, excluding contingency. Our studies, which have already started, will include: Evaluation of the flavor-tagging efficiency for different phototube diameters at different mean number of interactions per crossing; refinement of the mechanical design including optimization of dead space in photon detector planes, electronics support, cooling and cable routing. If this modification to the baseline is required, it will be subject to our formal change control procedure.

2. **Develop an intermediate level of milestones.**

The milestone strategy is being rethought. An intermediate level of milestones will be created.

3. **Clean up the installation schedule.**

The installation schedule is tightly coupled to the other subsystems in BTeV. This, in turn, depends on the Tevatron shutdown schedule. We also must fit into the budgetary guidelines. Our strategy now is to produce first the large RICH tank and the mirrors, so they can be moved in early. We also will need to produce the phototube assembly for the top of the RICH tank as it is difficult to mount this once the tank is in place. We now believe it is possible to mount and test the rest of the photon detectors in the assembly building and mount them as units in shorter shutdowns. We are continuing to work on the installation schedule in conjunction with the Installation and Integration group.

Other Issues:

- **If the funding profile allows it, it would be advantageous to lock in the choice for the main photo-detector, both from the perspective of fixing the final price and for elimination of the need for multiple design paths for things such as mechanical supports and readout electronics.**

We will continue to keep both the HPD and phototube systems for the gas radiator as options, since we believe that either system will work and one acts as a possible backup for the other. Keeping both systems viable will work to keep the price of the final system down, as this is the most expensive part of the entire detector.

WBS 1.4:

Recommendations:

1. **Study the relative crystal-to-crystal response to blue LED light and the correlation to PMT gain and radiation damage of the crystals. Understand better how to apply these corrections to BTeV running conditions.**

We are continuing our work to understand the relative crystal-to-crystal response to blue LED light under radiation conditions. We have a great deal of data to analyze from our previous test beam runs. We are working toward a coherent picture of how well we can calibrate the crystals to achieve our goal of a 0.55% constant term in the energy resolution. We note that KTeV using a similar crystal readout system based on photomultiplier tubes and QIE based electronics achieved a constant term of 0.45%

2. **Calculate the impact on physics processes due to deterioration of components due to radiation damage.**

These crystals are the same as being use in CMS where the effects of radiation have been shown not to significantly deteriorate their system. There the radiation levels are much higher than for most of our crystals. The CMS 10-year radiation levels go from 2.5 kGy at the center of their barrel to 4.5 kGy at the end of the barrel, to 200 kGy at the edge of their endcap. Only the top 20% of the BTeV crystals have 10-year doses in excess of 2.5 kGy and only 2% in excess of 25 kGy, where the crystals with the highest radiation doses are closest to the beam. Since these crystals are also the least efficient due to high occupancies, we find that the physics reach will only be affected at the few percent level due to radiation damage.

3. **Estimate the amount, cost and schedule of new components needed to be replaced if radiation damage deems them unusable.**

We do not believe that the radiation levels in BTeV will be high enough that they will be significantly radiation damaged in a 10 year period. Since the radiation levels are ten times higher for the 2% percent of the crystals closest to the beam we can estimate the cost of replacing them. We will enough spares to replace them, their associated phototubes and the readout. Thus the costs will be labor and time for a shutdown. The calorimeter structure is made so that we can open it and replace crystals. We estimate that it will take two technicians one week to open the structure and remove the associated cabling. About one week to replace the ~200 crystals and test them and another week to replace the cabling and close the structure. Thus it will take about one month to do this replacement and the costs will be labor for two-person-months of technician time.

4. **Continue to test all detector samples, especially PMTs from various vendors and with different windows, in a BTeV equivalent radiation environment.**

We will continue to test all detector samples, especially PMTs from various vendors and with different windows, in our high radiation test setup at Protvino. We note that the baseline tubes have quartz windows that are known to be very radiation resistant.

5. **Continue to try to solicit additional US physicists.**

We are actively contacting other U. S. groups, trying to get them involved with the BTeV EM calorimeter effort.

Other Issues:

- **The contingency changes suggested in the review are: reduce crystals from 40% to 37.5%, reduce PMT's from 30% to 12.5%, and increase electronics from 30% to 37.5%.**

We have implemented all the changes except the reduction in the PMT contingency, which we do not support.

WBS 1.5

Recommendations:

1. **Complete the WBS Dictionary**.

We are working at completing the WBS dictionary and basis of estimates. Our schedule is to complete this in the middle of December, though some new quotes might not be available until January.

2. **In conjunction with BTeV management, review the contingency estimates.**

The entire WBS will be gone over with BTeV management, especially the contingency estimates.

3. **Participate in a project-wide Installation, Integration and Infrastructure workshop**

We participated in the Nov. 13 Installation workshop. We continue to discuss installation schedules within the collaboration.

WBS 1.6:

Recommendations:

1. **Continue prototype tests with cosmic rays and in the test beam; involve outside institutions.**

The group is ready to carry out it beam test and is waiting for the availability of slow extraction to commence. Outside institutions will be involved.

2. **Confirm extent of straw stretching in candidate gas mixtures and with different types of straws; these tests should be long term to discover possible slow creep. Continue developing prototype mechanical supports for the half views.**

Frascati has prepared a test setup that will provide very controlled measurements. We are continuing to develop prototype mechanical supports. The effort is funding limited.

3. **Develop the carbon fiber manifold so that it can be used in prototype tests.**

The Frascati group will do this.

4. **Evaluate the loss of tracking efficiency in Monte Carlo for tracks near the cut out region with 396 ns bunch spacing. Coordinate with silicon strips people to find a different matching size, if necessary.**

We are actively pursuing this. Penny Kasper is working on evaluating the tracking issues with different designs. Alan Hahn is in close contact with the silicon strip group to develop options. We have will have a final design later this winter.

5. **Continue to refine (scrub) the WBS for better accuracy especially as new information is available.**

Agreed, time frame is end of the year ('03) or early '04.

6. **In the coming year start to document production and Q/A procedures in preparation for off site production.**

This is intended and is in the WBS for this year.

From the comments and findings:

- **It still looks like more technical help would be beneficial.**
- **It still looks like more mechanical engineering help would be beneficial.**

One mechanical engineer from the SiDet engineering group started working on straws near full time in late December. He will be assisted by a 2nd mechanical engineer from the SiDet engineering group for 6 months.

WBS 1.7

Recommendations:

1. **Costs recommended reflect no change in baseline, but a contingency of 35% is proposed based on lack of finalized designs in some areas, no contingency in the construction schedule and the resultant labor uncertainties.**

	Item	Project Estimate ($Millions)				Committee Estimate ($Millions)			
WBS		Base	Cont. %	Cont. $	Total	Base	Cont. %	Cont. $	Total
1.7	Silicon Strip Tracker	6.81	30%	2.05	8.86	$6.99	35%	2.45	$9.43

As a result of this increase in contingency the cost of the sub-detector increases of about 335K$ with respect to the last Temple Review.

Luigi Moroni will work to finalize designs. We accept the increase in contingency.

2. **Study carefully the post-irradiation performance of the specially shaped detectors surrounding the beam pipe.**

Radiation studies using CMS detectors are already in progress. We expect to be funded by INFN during 2004 to buy some of these specially shaped sensors and test their performance under radiation.

3. **Implement actions to increase the safety margins in the schedule for the development of the final front-end chip.**

We can certainly create much more schedule contingency for the FE development just loosening some crucial links among the activities in our present WBS.

4. **Start as soon as possible the design of the FE hybrid to be able to test the performance of the basic module, after irradiation, with final components.**

We will start this as soon as we can depending on the personnel availability at CD, who have agreed to work on the design, and available funds.

5. **Implement experimental tests on quasi-final ladders to qualify the proposed cooling system and all module material and components in terms of thermal properties and mechanical deformations.**

We are already working on this. Recently, we have started the design of the mechanical supports and cooling system together with Plyform, an Italian company specialized in carbon-fiber technology. We should have a mockup to test and qualify the design in the near future.

6. **Produce technical designs of the overall mechanical structure including thermal shield and define in detail the interface regions with the beam pipe and the Straw Tracker**.

We expect detailed designs of the mechanical structure to be produced by Plyform in the first months of the next year.

7. **Produce a set of production readiness milestones for the major components**.

We will certainly do it. Indeed, in the present version of WBS those are completely hidden in the file structure and difficult to find.

8. **Implement the level 3 management structure.**

We will designate level 3 managers as soon as possible.

9. **Document more fully all cost components of the project including minor details.**

We are going to revisit all our WBS and add in all the missing details.

WBS 1.8

Recommendations:

1. **Describe the level 1 switch in the TDR asap.**

A draft of the description of the Level 1 Switch has been completed. The final version of the text will be incorporated in the TDR in January.

2. **Develop a prototype level 1 switch and the test setup required to simulate realistic conditions.**

A prototype Level 1 Switch is part of the FY2006 plan. The trigger group intends to perform simulations of the Level 1 Switch in FY2005, and may be able to do the simulations as early as FY2004. Limited resources prevent this from being done sooner.

3. **Continue the pursuit of alternate processor solutions for the track and vertex processors, and build corresponding prototype daughter cards.**

This is also part of the FY2006 plan, but the trigger group would like to start working on this immediately. This depends on the availability of FY2004 funds. In the meantime, the trigger group will conduct a survey of microprocessors to identify suitable candidates.

4. **Evaluate RTES tools promptly with prototype hardware (at all levels).**

A review of the status of RTES, which will be based on the Super Computing 2003 Demo System, and its future goals will be conducted.

5. **(Strongly) encourage new institutions to contribute to the level 3 filtering software development. ---This is amplified in the findings: However, the development of the level 3 filtering software is severely understaffed, and BTeV is counting on joining institutions to contribute significantly to this effort. This issue is even more critical than in previous experiments, since BTeV sees level 3 as its offline platform. Conversion from raw data to DST happens at this stage.**

We have to get new collaborators or new people from existing collaborating institutions to work on this. We will make a major push on this.

6. **Develop a preliminary staged plan for reduction of data size to permanent storage from the full raw data to DST. Estimate the gains/drawbacks at each step and their impact on physics analysis.**

   We will establish a working group to study this and report early in the next year.

Other issues:

In addition, WBS numbering at Level 4 needs to be redone, WBS tasks for the Global Level 1 trigger have to be reorganized so they can be more easily identified and better tracked. Milestones need to be rationalized. The WBS dictionary and the BOE need work. RTES milestones and inter-project links need to be incorporated. Data rates and trigger rates at each level need to be rationalized throughout the trigger and with the DAQ. There are many other tasks on the list.

WBS 1.9

Recommendations:

1. **Develop a DCB prototype**.

   We agree and will add money and people to the effort early in the project

2. **Choose a clock distribution scheme and prototype the corresponding hardware. Investigate interactions with the various trigger and DAQ components**.

   A clock distribution scheme will be chosen by spring/summer of 2004

3. **Evaluate the radiation levels in the proposed DCB locations and their impact on DCB performance. Determine DCB location and verify adequate performance of the cables to the front-ends.**

   I have predictions for the radiation background from collisions (not from beam halo). We will certainly revisit this. We still have to validate our calculations. We will perform additional radiation tests.

Other Issues:

Other issues are the omission of mover nodes, which should be corrected ASAP; the use of tape rather than disk as the baseline data archiving method. We can defer the decision but we should estimate the relative cost of an all disk solution. This group

also has to work on its BOE and data dictionary. It also has substantial links to other subprojects that have to be installed. There are still some overlaps with 1.10.

WBS 1.10

Recommendations:

1. **Schedule a workshop with the I&I team and each of the other L2 managers to discuss how each group interfaces with this team and make sure the overall goal of a complete experiment is accounted for in one of the schedules. Have a formal sign-off with each L2 manager.**

A workshop was conducted on November 13 with the project managers, the detector subproject managers, the IR manager and the C0 building manager and other interested group members. The L2 managers are updating their installation, integration and commissioning documents and the activities in these documents will to checked to assure that they are accounted for in one of the schedules.

2. **Pick a reasonable lab shutdown schedule (say 6 weeks down every July/august) and go through the exercise of developing a full resource loaded schedule for the construction of the experiment. Look for conflicts in each subsystem as well as global resource demands.**

After consultation with Lab management about a feasible and even perhaps likely shutdown schedule, we have developed a first draft schedule after discussions with all project managers and sub-project managers. Rather than a final plan, it is a starting point that highlights the areas of potential conflict. There will be much more work to follow.

3. **Scrub the WBS plan – look for holes and inconsistencies. Rework the WBS so that it is in a form that is useful for the L2 managers to manage the project with.**

We are systematically reworking the 1.10 WBS to make it more uniform. Some activities that are currently distributed in each detector portion will be consolidated.

4. **Complete the cost estimates and BOE required in order to achieve CD2.**

Much of the M&S cost material was present but not well organized. Dictionary and labor BOE needs much work. Several task forces have been formed and are actively working to research and organize information that will be used for completing the RLCS. These include a cable plant, rack mounting, alignment, slow controls, and radiation monitoring task groups.

5. **Establish with the project office how conflicts in tasks 1.1, 1.10, 2, and 3 as they require space in the collision hall and assembly hall are resolved and how priorities are set.**

The Resource Loaded Schedule will be used to develop a workable installation plan taking into account the necessities required by the C0 building construction, the IR and all subprojects. The Project Office will develop the procedures for dealing with any changes in plan and how to resolve conflicts from schedule deviations

6. **Establish a set of sensible milestones that can track the progress of this project.**

We are reworking the milestones with a goal to have 20-30 significant completion milestones.

7. **Establish a rigorous configuration control system, controlled by the Project Office, in draft form before the DOE CD-1 review.**

We will investigate the configuration management plans of recent projects of similar scale to use as models for a developing a configuration management plan for BTeV We already have a system for tracking documents and software. Each system includes version control. However, the systems do no have sign-off or workflow attributes. We will look into establishing such a system or augmenting our existing system to meet these requirements. We will work with the lab staff in the relevant divisions and sections to adopt a drawing management system. We are very concerned that there is not fully coherent system that works between all the divisions and sections. We will study the practices in CDF, D0, and NUMI to look for good implementations in all these areas. We will also implement a "Parameter Book" for controlling the baseline detector and beam configuration. A formal change control process is partially defined in the Project Management plan and will be completed. We hope to have this done by the end of January, with the possible exception of the drawing control system.

8. **WBS 1.10 was originally created for installation of the detector, now that there is installation work associated with the IR and critical links to the Conventional Construction activities the project should consider elevating the Installation activities to a Level 2 in the WBS. For the same reason the Project Management section (WBS 1.11) is going to be moved to Level 2, the Installation should be moved because it would cover installation activities for the entire project.**

We believe that this sub-project is in its proper level of WBS structure.

WBS 1.11

Recommendations:

1. **Work with Fermilab Directorate to provide needed support at the Project Manager level. If the dual roles persist, the appointment of a (Principal) Deputy Project Manager with experience in project management, who is authorized to make decisions, and is dedicated full-time to the project might fill the need.**

We are working on this with Lab management. It will have to converge well before the Lehman review.

2. **Provide resources in Beams Division (BD) and Technical Division (TD) to support the IR Conceptual Design for CD-1 and the Preliminary Design for CD-2. Provide funding for FESS staff and subcontract work necessary to complete the CDR for CD-1 and conduct advanced conceptual design for CD-2.**

Much of this has been done. There are still some shortfalls that we are working on. This is as much a recommendation to the lab as to BTeV.

3. **Acquire additional staff in the Project Office needed to develop documentation in support of DOE Critical Decisions 0, 1, and 2. This would include a budget officer and permanent scheduler.**

We have a scheduler who will come on board in early January. We see no progress towards getting a budget officer. This is also a recommendation to the lab.

4. **Develop a project phasing scenario for completion of the conventional facilities and installation of detector components**.

We are working hard on this. We will have a draft schedule before the end of the year and will use it to do the phasing. The reality of the scenario will depend on the scheduling information it is based on.

5. **An additional focused Director's CD-1 Review on the IR, Conventional Facilities, and construction / installation phasing should be conducted prior to a DOE Lehman CD-1 Review.**

This is a recommendation to lab management but we endorse it and are encouraging the relevant project leaders to prepare for it.

6. **Complete the formally required DOE project management documentation to support CD-0 immediately, CD-1 in the next few months and CD-2/3 in the coming six months.**

We have drafts of most documents but these have not received DOE or lab approval. We will be working on the PEP, ASP, PMP and Hazard analysis in December. We will also update the CDR to make it more closely correspond to the current baseline.

7. **Establish 2 or 3 important Milestones per year for each Level 2 system as PM milestones. A subset of these milestones can then be used in the formal project documentation such as the PEP and supersets can be used by Level 2 and 3 managers to manage their systems.**

   We will do this after working with the Level 2 managers to rationalize our approach to milestones. We will try to have this all in reasonable shape by early January.

Schedule:

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1. **BTeV needs to review and scrub their milestones. Make sure milestones add value and identify key activities that are useful to manage the project and demonstrate progress.**

   We will do this

2. **BTeV needs information on future shutdown schedules and durations**

   We are in contact with the Directorate and have the latest schedule, which, however, is still very preliminary

3. **The schedules for the IR and Conventional Construction subprojects need to be completed and integrated into the overall Master Project Schedule as soon as possible in order to better analyze overall integration.**

   This is now being worked on.

There is a lot more work under management that is stated or implied in the findings, comments, and executive summary. We will be working in extracting them and then will add them to the list.

WBS 2.0

M Church, Jim Kerby 12/11/03

Recommendations:

1. **Laboratory and BTeV management need to assign L1 and L2 managers for the IR as soon as possible. Especially for the L1 and the L2 magnet system managers, this should be their major job assignment.**

Mike Church of AD has been assigned as Level 2 manager of the C0 IR project. He will be 100% dedicated to this project. A WBS structure is under development.

2. **Laboratory management needs to provide the needed manpower, estimated to be of the order of 6 FTEs in TD and 3 FTEs in BD to develop the conceptual design, WBS, and baseline cost and schedule ranges for the DOE CD-1 review anticipated for February. In addition, 3-4 more FTEs in TD will be required to establish the technical, cost and schedule baselines for the CD-2/3 review anticipated for late spring or summer 2004, and to do the necessary design work to allow long lead-time procurements to be placed in FY2004 and early FY2005, as required to support a 2009 start for BTeV running. The necessary personnel need to be assigned ASAP.**

   a) Additional Accelerator Division manpower has been assigned (current effort levels).
   - 2 cryo. engineers @ ~30% each -- cryogenic design.
   - 1 mech. engineer @ ~30% -- tunnel installation and integration.
   - 1 mech. engineer @ ~30% -- LCW design
   - 1 Mech. Support Dept. supervisor @ ~10% -- installation schedules
   - 1 programmer @ ~30% -- QPM design and controls issues
   - 1 elec. engineer @ ~20% -- PS layout, requirements, and design
   - 1 elec. technician @ ~20% -- QPM tunnel layout drawings
   - 1 physicist in Instrumentation Dept. -- assigned but not yet active
   - 1 physicist @ ~100% -- lattice design
   - 1 physicist @ ~40% -- project management
   - Specific requests have been made to the AD Head for additional calculational support equivalent to ~1.5 man-years of effort.

   b) Technical Division manpower has been assigned (current effort levels):
   - 1 engineer @~40% -- project management
   - 1 mechanical engineer @ ~30% -- engineering integration
   - 1 physicist @ ~50% -- magnet design, AP integration
   - 4 mechanical engineers @~30% each – cryostat and spool mechanical layouts, tunnel mechanical integration, Q1 – Q5 cold mass mechanical design
   - 1 physicist @ ~25% --electrical integration, HTS lead design
   - 1 scientist / engineer @ ~30% -- magnetic design
   - 1 cryogenics engineer @ ~30% -- cryogenic integration

   Effort will increase through the year as integration details are worked out and infrastructure work, such as test stands, is started.

3. **Schedule a follow-up Director's CD-1 review for the IR and other accelerator activities in the next 6-12 weeks. It should be late enough to allow serious work to be accomplished, while being far enough in advance of the DOE CD-1review to allow feedback from the Director's review to be acted upon.**

A CD-1 Director’s review for the C0 IR is tentatively scheduled for ~2/18/04.

WBS 3.0

Tom Lackowski

Conventional Construction

Recommendations

1. **Develop a schedule including a model of laboratory shutdowns to refine the scope and sequence of Civil Outfitting contracts, and to identify any places where the Civil Outfitting impacts the project critical path.**

Critical Path Network schedules have been developed for the proposed conventional construction contracts. The scope of work that requires a beam shutdown continues to be defined and interfaces with other portions of the project are being integrated into the expected shutdown duration. Conventional Construction work in the Collision Hall currently includes fire detection, electrical distribution and HVAC system commissioning. The installation of a new feeder through the existing Main Ring duct bank and connection to feeders for support of the IR is the balance of the shutdown work scope at this time.

The transfer of the Conventional Construction Microsoft Project schedule format into the project Open Plans schedule will facilitate a method to link to the various schedule requirements of the project.

2. **Define a formal approval procedure to ensure that all physics subsystem requirements, including schedule requirements, are transmitted to the Civil Construction managers and approved by all other relevant system managers.**

The project will be distributed for review and comments via the established lab-wide "Document Review Procedure", dated May 2001. In addition to the Fermilab distribution the documents, including drawings, descriptive text, cost estimate and schedule will be distributed to all of the projects level one and level two managers. Comments will be received by the established method and E-mail for those not at Fermilab. Responses will be posted on the BTeV web site. In addition weekly coordination with various groups within the project and Fermilab help define the design criteria.

3. **Produce a complete drawing set of the conceptual design including electrical and process piping required for the collision hall and assembly hall.**

Eight electrical drawings have been developed including floor plans at each level, and single line drawings. Switchboards, transformers and distribution panels are located and labeled on the plans. The mechanical drawings have been expanded to indicate major equipment layout and piping distribution on the plans. The plans indicate the design criteria for temperature, humidity, purge requirements, fire protection and fire detection. Schematic and block diagrams are delineated. Architectural cross sections provide pictorial integration of the various architectural, structural, mechanical, electrical and fire protection